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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/679,611	10/06/2003	Tapesh Yadav	037768-0137	3294

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PPG INDUSTRIES INC
INTELLECTUAL PROPERTY DEPT
ONE PPG PLACE
PITTSBURGH, PA 15272

EXAMINER	
CHRISTIE, ROSS J	

ART UNIT	PAPER NUMBER
1731	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/679,611	YADAV ET AL.
	Examiner	Art Unit
	ROSS J. CHRISTIE	1731

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _27 October 2010_.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _17-41_ is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) _17-41_ is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Prosecution History

1. Examiner acknowledges receipt and entry of Applicants' Request for Continued Examination and Amendment filed October 27, 2010.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 32, 33 and 38-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 4,944,985 to Alexander (hereinafter "Alexander").

Referring to Applicants' claims 32 and 33, Alexander teaches ultra-fine particles having a size in the range of 5 to 500 nm (col. 1, ll. 10-12) which may comprise crystalline or amorphous materials as well as metals (such as copper), ceramics as well as their composites (col. 1, ll. 16-17; and col. 6, ll. 21-40). Alexander also specifies particle sizes less than 100 nm (col. 15, l. 44) and 200 nm (col. 13, ll. 24-25). Alexander teaches forming an aquasol containing the ultrafine particles are disposed in a cation exchange resin containing a strong acid group (col. 17, l. 38 - col. 18, l. 51; Example 1; the cation exchange resin is equivalent to Applicants' claimed matrix comprising a polymer material; a formulation containing ceramic ultrafine particles of Alexander is equivalent to Applicants' claim language "a matrix comprising a ceramic material").

At the time the invention was made a person having ordinary skill in the art would recognize combining the ultrafine particles with the cation exchange resin necessarily coats the ultrafine particles such that said ultrafine particles easily disperse within the screen printable formulation composition taught by Alexander. It would be obvious to a person having ordinary skill in the art to coat the ultrafine particles of Alexander with the cation exchange resin prior to adding the ultrafine particles to said resin in order to enhance the compatibility of the ultrafine particles with said resin and further improve

the dispersibility of the ultrafine particles in the resultant screen printable formulation taught therein.

Referring to Applicants' claims 38-41, Alexander also teaches that the ultra-fine particles may be used to manufacture products such as conductive paints, pastes or inks (column 13, lines 41-47).

However, Alexander does not teach explicitly the formation of a print using these products per applicant claims 39 and 41 (col. 13, ll. 41-47).

Nonetheless, it is known in the printing arts that inks, for example, are suitable in the formation of printed matter and one skilled in the art would have utilized the ink product of Alexander et al., by known printing methods and with no change to their respective functions and/or operations, thus yielding the predictable result of a printed article.

6. Claims 17-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 5,759,737 to Feilchenfeld et al. (hereinafter "Feilchenfeld") in view of United States Patent No. 4,944,985 to Alexander (hereinafter "Alexander") and United States Patent No. 3,185,589 to Damm et al. (hereinafter "Damm").

Referring to Applicants' claims 17, 24 and 32, Feilchenfeld teaches a method of making a component carrier such as conductive adhesive interconnections for use in chip carrier packages, integrated circuits, wiring boards, and assemblies in computer systems (See Abstract of Feilchenfeld). Feilchenfeld teaches employing a matrix

comprising a polymer material (See Abstract; col. 1, ll. 5-19; col. 4, ll. 59-61; col. 6, ll. 24-46, the polymer material of Feilchenfeld is a thermoset or thermoplastic polymer) ; and metallic fillers (per Applicants' claims 17 and 24) or nanofillers (per Applicants' claim 32) (col. 6, ll. 47-67; col. 12, ll. 14-16; col. 14, ll. 65-67; the metallic fillers of Feilchenfeld are Ag flakes) with domain size less than 250 nanometers (per Applicants' claim 32) or 100 nanometers (per Applicants' claims 17 and 24) and an aspect ratio greater than one (col. 6, ll. 47-67, the Ag flakes of Feilchenfeld have an average width at least two times the average thickness which provides an aspect ratio of greater than one).

Although Feilchenfeld teaches employing metallic fillers having an aspect ratio of greater than one, Feilchenfeld does not teach explicitly the metallic fillers have a domain size less than 250 nanometers or 100 nanometers according to Applicants' claims 17, 24 and 32. And, although Feilchenfeld teaches employing metallic fillers having an aspect ratio of greater than one, Feilchenfeld does not teach explicitly the fillers may also be ceramic fillers, and ceramic fillers having a domain size less than 100 nanometers, per Applicants' claim 24. Lastly, although Feilchenfeld teaches employing metallic fillers having an aspect ratio of greater than one, Feilchenfeld does not teach explicitly the metallic fillers are nanofillers comprised of copper per Applicants' claim 32.

However, Alexander teaches employing metallic fillers possessing an ultrafine particle size of below about 20 microns in a variety of products including metallic inks (col. 9, ll. 7-12; col. 15, l. 63 - col. 16, l. 16 of Alexander). For instance, Alexander teaches utilizing ultrafine particles, such as Ag composites, having particles sizes of 7,

12 or 22 nanometers in metallic inks (col. 15, l. 63 - col. 16, l. 16; col. 20, l. 38 – col. 21, l. 22, Example 5 of Alexander). And, the ultrafine particles of Alexander may be either crystalline, amorphous, metals or ceramics (col. 9, ll. 16-17 of Alexander, for example, Alexander teaches the ultrafine particles are copper ultrafine particles). Alexander teaches the ultrafine particles disperse easily throughout the formulation taught therein which is rolled to a thickness of about 10 mils (col. 13, ll. 48-62).

At the time the invention was made a person having ordinary skill in the art would be motivated to utilize Ag flakes of Feilchenfeld, or the ceramic ultrafine particles of Alexander, having the ultrafine particle size taught by Alexander. Alexander demonstrates utilizing the ultrafine particles in a metallic ink formulation produce a useful silk screen ink (See Example 5 of Alexander). A person having ordinary skill in the art would be motivated to manufacture the conductive adhesive interconnections of Feilchenfeld utilizing the Ag flakes having an ultrafine particle size of Alexander in order to produce thin films of about 10 mils per Feilchenfeld's teachings (col. 3, ll. 10-15).

Although Feilchenfeld teaches employing metallic fillers, Feilchenfeld does not teach explicitly the metallic fillers are coated with a layer of material that is compatible with the matrix, the coating comprising a material selected from the group consisting of a polymer and a monomer per Applicants' claim language.

However, Damm teaches a method of coating finely divided metal particles based upon electrostatic attraction between positively charged metal particles and negatively charged resin particles (col. 1, ll. 10-15 of Damm). Damm teaches the resin is a thermoplastic resin (col. 1, l. 48 - col. 2, l. 2 of Damm). Damm also teaches an

important advantage of the process lies in the new capability of providing an extremely thin coating of resin of any desired hardness for magnetic metal materials particularly useful in preparing magnetic inks having superior printing characteristics owing to the thinner coating being produced (col. 2, ll. 22-29).

At the time the invention was made a person having ordinary skill in the art would be motivated to coat the metallic particles of Feilchenfeld using a polymer material, such as the thermoplastic resins of Damm, also taught by Alexander. Damm provides adequate suggestion and motivation to employ polymer coated metallic particles in order to produce inks having superior printing characteristics as taught therein. Despite the fact that Feilchenfeld, Alexander and Damm teach different types of ink formulations, a person having ordinary skill in the art recognizes all three prior art references teach screen printable formulations and hence their respective components are interchangeable to the degree necessary in order to promote innovation and achieve superior results.

Referring to Applicants' claims 18-20 and 25-27, Feilchenfeld teaches the Ag flakes have an average width at least two times the average thickness which provides an aspect ratio of greater than one, which encompasses particle shapes such as nanowhiskers, fibers and plates (col. 6, ll. 47-67 of Feilchenfeld).

Referring to Applicants' claims 21, 22, 28 and 29, Feilchenfeld teaches the screen printable formulation is an ink or a paste (See Abstract; col. 1, ll. 5-19; col. 4, ll. 59-61; col. 6, ll. 24-67; col. 12, ll. 14-16; col. 14, ll. 65-67).

Referring to Applicants' claim 23, 30 and 31, Alexander et al. also disclose that the ultrafine particles may comprise crystalline or amorphous materials as well as metals, ceramics and their composites (column 1, lines 16-17). Alexander et al. disclose that suitable materials include: silica carbon, alumina, tin oxide, zirconia, metal powders such as molybdenum, tungsten, copper, nickel, iron, cobalt and alloys of these metals or these with other metals water insoluble metal silicates (e.g., zinc silicate, lead silicate, aluminum silicate, calcium aluminum silicate, magnesium aluminum silicate, zirconium silicate, sodium aluminum silicate, potassium aluminum silicate and rare earth metal silicates), metal oxides, complex oxides or other material which may or may not be inert and which can be processed into ultrafine particles (column 6, lines 21-36).

At the time the invention was made a person having ordinary skill in the art would be motivated to utilize Ag flakes of Feilchenfeld, or the ceramic ultrafine particles of Alexander, having the ultrafine particle size taught by Alexander. Alexander demonstrates utilizing the ultrafine particles in a metallic ink formulation produce a useful silk screen ink (See Example 5 of Alexander). A person having ordinary skill in the art would be motivated to manufacture the conductive adhesive interconnections of Feilchenfeld utilizing the Ag flakes having an ultrafine particle size of Alexander in order to produce thin films of about 10 mils per Feilchenfeld's teachings (col. 3, ll. 10-15).

Referring to Applicants' claim 33, Feilchenfeld teaches a screen printable formulation (col. 11, ll. 3-10 of Feilchenfeld) comprising a matrix comprising a ceramic material (col. 11, ll. 3-10; the combination of ceramic particles, solvent and binder of Feilchenfeld are equivalent to Applicants' matrix, and the ceramic particles are equivalent to the ceramic material); and nanofillers with domain size less than 100 nanometers, the nanofillers selected from the group consisting of metallic nanofillers and ceramic nanofillers.

Although Feilchenfeld teaches employing metallic fillers, Feilchenfeld does not teach explicitly the metallic fillers are nanofillers or metallic nanofillers with a domain size less than 100 nanometers according to Applicants' claim language.

However, Alexander teaches employing metallic fillers possessing an ultrafine particle size of below about 20 microns in a variety of products including metallic inks (col. 9, ll. 7-12; col. 15, l. 63 - col. 16, l. 16 of Alexander). For instance, Alexander teaches utilizing ultrafine particles, such as Ag composites, having particles sizes of 7, 12 or 22 nanometers in metallic inks (col. 15, l. 63 - col. 16, l. 16; col. 20, l. 38 – col. 21, l. 22, Example 5 of Alexander). And, the ultrafine particles of Alexander may be either crystalline, amorphous, metals or ceramics (col. 9, ll. 16-17 of Alexander, for example, Alexander teaches the ultrafine particles are copper ultrafine particles). Alexander teaches the ultrafine particles disperse easily throughout the formulation taught therein which is rolled to a thickness of about 10 mils (col. 13, ll. 48-62).

At the time the invention was made a person having ordinary skill in the art would be motivated to utilize Ag flakes of Feilchenfeld having the ultrafine particle size taught by Alexander. Alexander demonstrates utilizing the ultrafine particles in a metallic ink formulation produce a useful silk screen ink (See Example 5 of Alexander). A person having ordinary skill in the art would be motivated to manufacture the conductive adhesive interconnections of Feilchenfeld utilizing the Ag flakes having an ultrafine particle size of Alexander in order to produce thin films of about 10 mils per Feilchenfeld's teachings (col. 3, ll. 10-15).

Referring to Applicants' claims 34-41, Feilchenfeld teaches a screen printable formulation, as set forth, above, that may be used, as per applicant claims 34, 36, 38 and 40, to manufacture products such as conductive paints, *pastes* or inks, including the formation and/or manufacture of a print or product using the screen printable formulation as per applicant claims 35, 37, 39 and 41.

7. Examiner draws Applicants' attention to the following prior art considered relevant but not applied in the rejections against the pending claims: United States Patent No. 4,292,029 to Craig et al. and United States Patent No. 5,718,047 to Nakayama et al.

Response to Arguments

8. Applicants' claim amendments, see Amendment, filed October 27, 2010, with respect to the rejections of claims 32, 33, 38-41 under 35 USC 103(a) as being unpatentable over Alexander; claims 17-31 and 34-37 under 35 USC 103(a) as being unpatentable over Alexander in view of Craig or Nakayama have been fully considered and are persuasive. Therefore, these rejections have been withdrawn. However, upon further consideration, a new ground of rejection is made in view of United States Patent No. 5,759,737 to Feilchenfeld et al., United States Patent No. 4,944,985 to Alexander and United States Patent No. 3,185,589 to Damm et al.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROSS J. CHRISTIE whose telephone number is (571)270-3478. The examiner can normally be reached on Monday-Friday 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571) 272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ross J. Christie/
Patent Examiner, Art Unit 1731

/JERRY A LORENGO/
Supervisory Patent Examiner, Art Unit 1731